Journal of Comprehensive Surgery

Review

DOI: 10.51271/JOCS-0037

Gastric volvulus in children: diagnosis and treatment approaches

Sevgi Ulusoy Tangül

Department of Pediatric Surgery, Faculty of Medicine, Yozgat Bozok University, Yozgat, Turkiye

Cite this article: Ulusoy Tangül S. Gastric volvulus in children: diagnosis and treatment approaches. *J Compr Surg.* 2024;2(3):60-65.

Corresponding Author: Sevgi Ulusoy Tangül, sevguu@gmail.com

Received: 06/04/2024 ◆ **Accepted**: 18/04/2024 ◆ **Published**: 27/08/2024

ABSTRACT

Gastric volvulus is a sporadic disease in the pediatric age group and is very complex in terms of etiology and management. In this study, we aimed to discuss 2 late-diagnosed gastric volvulus cases, review the diagnosis and treatment methods of gastric volvulus cases in the pediatric age group encountered in the literature, and reduce concerns about the correct diagnostic approach to these cases. The first case was an 8 year old girl who was followed up due to developmental delay and metabolic disease and was admitted due to recurrent vomiting attacks. Endoscopic reduction was first performed on patients whose upper gastrointestinal tract imaging was compatible with organoaxial gastric volvulus. Since vomiting attacks continued, laparoscopic gastropexy was performed. In the postoperative follow-up, there was weight gain and vomiting complaints wholly regressed. The second case; was a 1-year-old girl who was treated for gastroesophageal reflux at an external center due to vomiting and developmental delay, but she did not receive any response. The endoscopic reduction was performed because the patient's upper gastrointestinal imaging was compatible with the organoaxial gastric volvulus. Laparoscopic gastropexy was performed on the patient whose vomiting recurred. The stomach was expected in the upper passage imaging in the postoperative period. In the systematic search made in the MEDLINE/Pubmed database using the keywords "gastric volvulus and pediatric", 41 literature articles presenting 47 cases between 2013 and 2023 were included. The patient's age, gender, complaints admission, type of gastric volvulus, and treatment-related data were collected. The most common symptoms in the patients were vomiting, abdominal pain, and the most common comorbidities were diaphragmatic pathologies and wandering spleen. The most preferred treatment was anterior gastropexy. Gastric volvulus is a condition that is characterized by vomiting, abdominal pain, and developmental delay, and is very difficult to diagnose, especially in chronic cases. In addition to the conservative approach in chronic cases, anterior gastropexy should be preferred to prevent recurrent volvulus attacks.

Keywords: Gastric volvulus, child, gastropexy

INTRODUCTION

Gastric volvulus (GV) is a rare condition in the childhood age group. It is defined as the abnormal rotation of all or part of the stomach around itself along the transverse or longitudinal axis of more than 180°. It can lead to gastrointestinal obstruction.[1,2] It usually occurs in children under 1 year and older adults over 50. No relationship with gender or race was detected.[3]

Gastric volvulus can be organoaxial or mesenteroaxial type. Approximately 2/3 of the cases are of the organoaxial type, which occurs when the stomach rotates around the pylorus and gastroesophageal junction.[1] Mesenteroaxial rotation is less common and is seen when the stomach rotates in a longitudinal line parallel to the gastrohepaticomentum.[4]

In 10% to 30% of cases, gastric volvulus is considered primary and is caused by looseness of the stomach's gastrohepatic, gastrocolic, gastrosplenic, and gastrophrenic ligaments. Diaphragmatic hernia and spleen anomalies may also cause gastric volvulus secondaryarily.[1,3,5]

Gastric volvulus can occur acutely or with intermittent, recurrent and chronic symptoms. A good history and physical examination raise suspicion of the diagnosis of gastric volvulus.[3] In symptomatic patients, abdominal and upper GI passage radiographs confirm the diagnosis.[6]

This study, based on two cases operated on due to gastric volvulus, aimed to examine the literature on gastric volvulus in children and highlight areas that may allow early diagnosis of these cases and prevention of complications.

CASE 1

An 8-year-old female patient, who was referred by pediatrics with complaints of nausea and vomiting and was followed up at an

This work is licensed under a Creative Commons Attribution 4.0 International License.

external center with preliminary diagnoses of developmental delay, muscle disease, and/or metabolic disease, was hospitalized to regulate her oral intake and evaluate her stomach anomalies. Since organoaxial gastric volvulus was detected in the upper passage radiograph (Figure 1), gastroscopy was planned to evaluate whether the patient needed additional treatment. The gastroscopy detected no pathology, and the patient continued to be fed via nasogastric. Diagnostic laparoscopy was performed on the patient whose gastric volvulus continued to appear on the control upper passage radiograph. On exploration, the stomach appeared 180 degrees volvulated in the prepyloric region. The patient underwent laparoscopic gastropexy. The patient did not vomit in the postoperative period. The control upper passage radiograph taken in the sixth postoperative month showed that the stomach appeared normal (Figure 2).

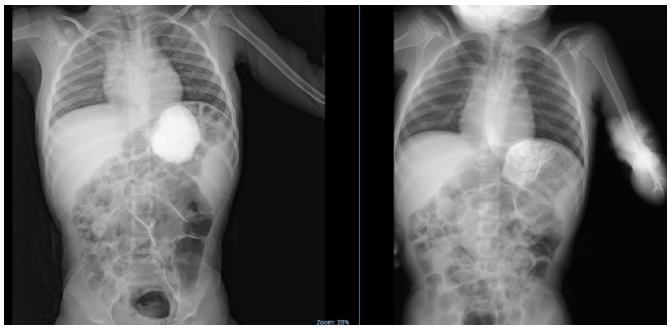

Figure 1. Preoperative contrast radiography of the upper GI tract of Case 1

Figure 2. Postoperative contrast radiography of the upper GI tract of Case 1

CASE 2

A 1-year-old girl with developmental delay, who was followed up at an external center with the diagnosis of gastroesophageal reflux due to vomiting, was hospitalized for oral nutrition regulation and examinations. In the patient's medical history, it was learned that the gastroesophageal reflux treatment that was started previously did not produce a response. In addition, since the upper passage radiographs taken in another center approximately six months ago showed gastric volvulus, the patient was diagnosed with chronic gastric volvulus. The patient underwent gastroscopy and upper passage radiography under anesthesia. There was a nodular appearance in the duodenum during gastroscopy. The upper passage radiograph observed that the opaque material did not pass into the duodenum (Figure 3). The patient underwent laparoscopic gastropexy with the preliminary diagnosis of organoaxial gastric volvulus. In the postoperative period, it was observed that the patient's vomiting complaints improved, and weight gain occurred. The stomach appeared normal in the upper passage of the radiograph taken 3 months postoperatively (Figure 4).

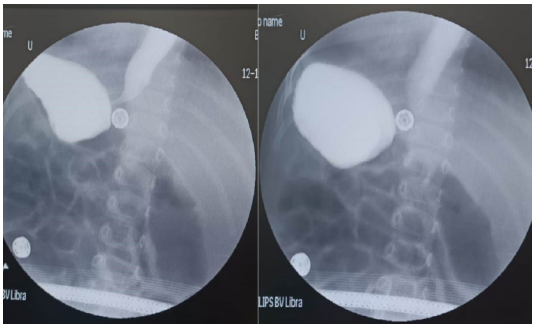

Figure 3. Preoperative contrast radiography of the upper GI tract of Case 2

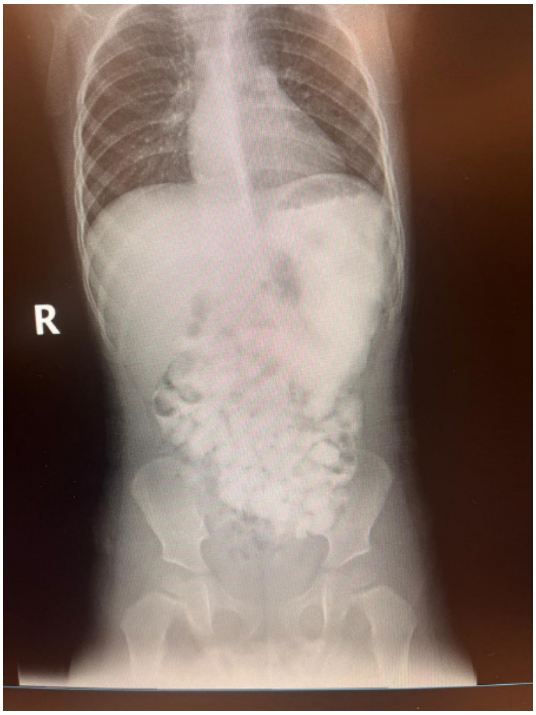

Figure 4. Postoperative contrast radiography of the upper GI tract of Case 2

METHODS

A systematic search was performed in the MEDLINE/Pubmed database using the keywords "gastric volvulus and pediatric". Inclusion criteria were reports published in English that included a description of cases of gastric volvulus in patient's under 18 years of age between 2013 and 2023. Exclusion criteria were non-English literature, studies involving cases older than 18 years, compilations, letters to the editor, and the inability to access the entire article. Data regarding the patients' age, gender, complaints at the time of admission, imaging method used in diagnosis, type of GV, and treatment were collected. In the search made with these parameters, 41 pieces of literature were evaluated.

RESULTS

In total, 47 patients were presented in 41 literature reviews. Twenty-three patients were male, 24 were female, and the age range was 1 day to 18 years. The most common symptoms were non bilious vomiting and abdominal pain. Most cases were in the form of acute gastric volvulus. Although the type of volvulus was not specified in some literature, mesenteroaxial GV was detected in 21 cases, organoaxial in 20 cases, and combined the GV in 1. in other cases, GV type was not specified. Upper GI passage radiography was mainlyused in diagnosis. The most common comorbidities were wandering spleen and diaphragmatic hernia. The most preferred treatment was open or laparoscopic anterior gastropexy. Differently, endoscopic reduction was also performed in 5 cases in the literature. Only one of the reviewed literature reported spontaneous reduction in follow-up upper GI passage imaging. The reviewed literature is given in Table.

DISCUSSION

Pediatric gastric volvulus (GV) is a surgical emergency characterized by variable degrees of stomach rotationaround its short or long axis and can lead to gastrointestinal obstruction.[4] Singleton classified gastric volvulus as organoaxial, mesenteroaxial, and combined, according to the axis around which the stomach rotates.[44] Organoaxial GV is the most common type (59%), describing the rotation of the stomach on a longitudinal axis connecting the gastroesophageal junction with the pylorus. Strangulation and necrosis are frequently observed.[8] Mesenteroaxial GV is the second most common type in which the mesenteroaxial axis divides the lesser and greater curvatures of the stomach into two.[5] The less common combined type is in which mesenteroaxial and organoaxial stomach rotation coincide, primarily observed in patients with chronic GV.[4] Both patients we treated had organoaxial type gastric volvulus.

Although the exact cause of GV is not fully known, its pathogenesis can be explained by the laxity of the gastrosplenic or gastrocolic ligaments.[5] The frequent presence of diaphragmatic defects allows the stomach to migrate towards the thorax. Congenital diaphragmatic defects, Morgagni, and paraesophageal hernia are major predisposing factors associated with acute gastric volvulus.[6,11,16,18,20-23,31,34,36,40,41,43] The wandering spleen is also frequently seen with GV.[10,12-14,21,23,25,34,40] Among the two cases we followed up with chronic type organoaxial GV, our 8-year-old girl was being followed up due to metabolic disease and muscle disease. Apart from this, there was no additional diaphragmatic defect or wandering spleen in either of our cases.

GV can be seen clinically as acute or chronic. While the most common symptoms in acute cases are vomiting, abdominal pain, and abdominal distension, recurrent vomiting attacks, developmental delay, and abdominal pain are prominent in chronic cases.[30] Upper GIS imaging is efficient in diagnosing, especially in chronic GV cases. While radiological imaging methods such as plain abdominal radiography, abdominal ultrasound, and computed tomography help diagnosis with low sensitivity in suspicious cases, the effectiveness of upper GI imaging examinations in making the diagnosis is around 93%.[1,6,15] In our first case, although upper passage imaging had been performed previously, GV was missed due to inadequate examination evaluation and was evaluated as gastroesophageal reflux. In our second case, upper GI imaging was not performed, and vomiting and developmental delay were attributed to gastroesophageal reflux. We detected organoaxial GV in the upper GIS imaging we performed in both cases. From this perspective, upper GI imaging efficiently diagnoses cases with chronic GV.

Endoscopic examination can be used both for diagnostic purposes to evaluate the gastric mucosa and for therapeutic purposes to reduce GV. Endoscopic treatment has been used successfully to treat patients with high surgical risk and acute presentation while allowing decompression and reduction of volvulus; it is also preferred in most chronic cases.[13-15,17,24,27] We first tried endoscopic reduction in two cases we followed due to chronic GV. Although their complaints subsided for a while after endoscopic treatment, vomiting attacks continued in both cases. Thereupon, we performed laparoscopic anterior gastropexy in both of our patients.

Surgical intervention in GV aims to fix the stomach and limit the possibility of recurrence. The generally preferred surgical procedure is open or laparoscopic anterior gastropexy, in which the greater curvature of the stomach is fixed to the anterior abdominal wall.[4] However, partial or total gastrectomy may be preferred in case of GV-related gastric necrosis depending on the degree of ischemia.[16,20,42] Laparoscopic anterior gastropexy was preferred as a surgical intervention in both of our cases.

CONCLUSION

GV is a condition that can frequently occur with various symptoms, such as vomiting, abdominal pain, abdominal swelling, and developmental delay. It is tough to diagnose and treat, especially in chronic cases. The treatment approach in cases presenting with acute GV is surgery. A conservative treatment approach may be preferred in clinically and radiologically suspected chronic cases. However, it would be appropriate to consider anterior gastropexy as the first choice to prevent recurrent volvulus attacks.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

Table. Age, gender, clinic, GV type, comorbidities and treatments of the patients in the literature evaluated

Article	Age	Gender	Symptom	Type	Comorbidity	Treatment
McCarty[7]	2 months	M	Choking episodes, vomiting	OA	-	Laparoscopic gastropexy and gastrostomy
Trecroci[8]	16 months	F	Recurrent and postprandial vomiting episodes, which started at 11 months of age. A history of gastroesophageal reflux	OA	-	Anterior gastropexy and Nissen fundoplication
	9 mounths	M	Chronic, recurrent, postprandial vomiting, which started at 7 months of age. A history of gastroesophageal reflux	OA	-	Anterior gastropexy and Nissen fundoplication
Malhotra[9]	4 years	F	Retching and abdominal colic	MA	-	Gastropexy, gastrostomy and jejunostomy
Patoulias[10]	6 years	M	Repeatedly non bilious vomiting and food refusal during the last 72 hours before admission	OA	Wandering spleen	Exploratory laparotomy, anterior gastropexy
Zain, Mostafa[11]	8 years	M	Acute episode of severe epigastric pain, and uncontrolled non bilious vomiting	OA	Left diaphragmatic defect	Laparotomy, diaphragmatic defect repair, anterior gastropexy
Bhambu[12]	2 years	M	Abdominal pain, intractable retching with one episode of non-bilious vomiting for two to three hours, and a suspected history of foreign body ingestion	MA	Wandering spleen	Laparotomy, anterior gastropexy, splenopexy
Yokoyama, Koji[13]	3 years	M	The acute onset of abdominal pain and repeated non-bilious vomiting	MA	Wandering spleen	Gel immersion endoscopy, laparoscopic splenopexy eight months later
Yeh,Pai-Jui[14]	4 years 8 months	F	The progressively frequent episodes of abdominal pain along with a nonbilious but coffee-ground emesis for four days	MA	Wandering spleen	Endoscopic reduction, laparoscopic anterior gastropexy
Tillman, Bourke[5]	6 years	F	4 h history of vomiting and abdominal pain	OA	-	Laparotomy, anterior gastropexy
Haga,Mitsuhiro[15]	6 years	F	Suddenly developed abdominal pain and nausea	MA	-	Endoscopic reduction
Perez-Egido[16]	56 days	M	24 h history of nonbilious nonfeeding related vomiting	MA (preop OA)	Left diaphragmatic eventration, hypertrophic pyloric stenosis	Laparotomy closure of the diaphragmatic defect, Ramstedt pyloromyotomy and anterior gastropexy
	4 years	F	24 h abdominal pain and nonbilious vomiting, chronic postprandial abdominal pain history	MA	Left diaphragmatic hernia	Laparotomy, closure of the diaphragmatic defect and anterior gastropexy
Hara,Tomoko[17]	4 years	M	Sudden onset nausea, upper abdominal pain, and abdominal distension	MA	-	Fluoroscopy-guided endoscopic reduction
	8 years	F	3 weeks history of vomiting and a high gastric residual volume	MA	Neurological disorders	Endoscopic reduction, after 2months elective laparoscopic gastrostomy
Shadrack, Mathayo[18]	6 months	F	Projectile, bilious vomiting for four days, inability to pass stool, abdominal distention for three days		Left diaphragmatic defect	Correction of rotation of the stomach, diaphragmatic defect was repaired
Takahashiş, Toshiaki[2]	6 years	M	Suddenly have abdominal pain and vomiting	MA	-	Single-incision laparoscopic gastropexy
	4 years	M				
	2 years	F				
Porcaro, Federica[4]	16 months	F	11 months of age, occurring, on average, 6 times per day. A history of gastroesophageal reflux unresponsive to drug therapy	OA	Gastroesophageal reflux	Gastropexy, both anterior and fundal, without fundoplication
Kadam, Rahul[6]	1 day	M	Severe respiratory distress soon after birth	MA	Left sided congenital diaphragmatic eventration	Laparotomy, stomach detorsion, plication of diaphragm, anterior gastropexy
Nalwalla, ZahaZahabiya[19]	1 years	F	Abdominal distension for 1 week, intermittent abdominal pain	OA	Left diaphragmatic defect	Gastropexy with left diaphragmatic repair
Kumar, Shishir[20]	9 years	M	Acute onset abdominal pain, a history of several episodes of similar pain in the preceding three months	MA	Diaphragmatic defect	Gastropexy, gastrostomy, diaphragmatic repair
Oyachi, Noboru[21]	Newborn	F	Operated Bochdalek hernia, inability to tolerate enteral nutrition in the postoperative period	OA	Bochdalek hernia, wandering spleen	Laparotomy, gastric decompression duodenum enteral feeding tube, anterior gastropexy
Miyano, Go[22]	5 years	F	Sudden onset of severe epigastric pain accompanied by nonbilious vomiting after eating	MA	Diaphragmatic eventration	Laparoscopic gastropexy plication of diaphragm
Kataria, Riya[23]	13 years	M	Abdominal pain, nausea and vomiting that has been going on for 10 days		Diaphragmatic eventration, wandering spleen	Splenopexy, anterior gastropexy, diaphragmatic repair
Cianci, Maria Chiara[24]	10 years	F	Recurrent attacks of nonbilious vomiting, weight loss and liquid defecation for 5 months	OA	-	Laparoscopic assisted percutaneous endoscopic gastrostomy
Umeda, Satoshi[25]	12 years	M	Abdominal distansion and vomiting		Wandering spleen	Splenopexy, anterior gastropexy
Jones, Gurpal[26]	3 years	F	Intractable, nonbloody, nonbilious emesis, and decreased oral intake and urine output	OA	-	Gastrostomy, gastropexy
Lee, Han Shin[27]	9 years	M	Recurrent abdominal pain, upper abdominal discomfort and bloating after meals, and intermittent vomiting attacks lasting 1 year. Use of prokinetic drugs for 3 months with a preliminary diagnosis of GERD	Chronic GV	Hepatoblastoma	Laparoscopic detorsion, gastropexy

Table. Age, gender, clinic, GV type, comorbidities and treatments of the patients in the literature evaluated (Continues)

Article	Age	Gender	Symptom	Type	Comorbidity	Treatment
Tetsuhara, Kenichi[28]	8 months	M	Decreased mental status persisting for about 2 hours	Mix tip	Hypertelorism, saddle nose, forehead creases and cleft lip, laryngomalacia and multicystic dysplastic kidney, malrotation	Laparoscopic gastrostomy, gastropexy and the Ladd procedure
Schneider, Joanna[29]	13 years	F	Nausea, non-bloody, non-bilious vomiting, abdominal pain	MA	Leprosy	Gastropexy
Qadri, Syeda Kashfi[30]	10 months	F	In upper GI imaging performed before gastrostomy placement	OA	Skeletal dysplasia (spondyloepiphyseal dysplasia congenital), posterior cleft palate, GORD and oropharyngeal dysplasia	Laparoscopic gastrostomy
Serradilla, Javier[31]	12 days	M	Recurrent nonbilious vomiting	MA	Marfan syndrome	Laparotomy, thal fundoplication, gastrostomy (Stamm)
Vaghela, Mamahesshkumar Manilal[32]	4 months	F	Non-bilious, non-projectile vomiting 20-30 minutes after each feeding, starting from 1 month of age	-	-	Laparotomy, anterior gastropexy
Hasan, M Tasdik[33]	17 years	M	Abdominal fullness and sudden onset of episodic epigastric pain after eating for 2 months. Bilious vomiting, frequently foul-smelling, nonprojectile, often containing undigested food material	OA	-	Laparotomy, anterior gastropexy
Cantone, Noemi[34]	13 years	F	Recurrent severe epigastric pain, abdominal distension, vomiting, history of Morgagni hernia and OA GV surgery	OA	Morgagni hernia, wandering spleen	Laparotomy, anterior gastropexy anterior Boerema gastropexy, splenopexy
Takano, Yoshihiko[35]	4 months	M	Cyanosis, hypotonia, apnea attacks. Gastric decompression by inserting a nasogastric tube	OA	Esophageal motility disorder epilepsy	Follow up upper GI imaging at 7 months was normal
Kumar, Kashish[36]	4 years	F	Upper abdominal pain, distension and non-bilious vomiting for the last 2 days	MA	Left diaphragmatic defect	Defect repair, anterior gastropexy
Farber, Benjamin A[37]	18 years	M	Left chest pain	MA	Inflammatory myofibroblastic tumor cholelithiasis	Laparoscopic gastropeksi, Stamm gastrostomisi
Espinola, Dimas C[38]	16 years	M	Acute onset epigastric pain, non-bilious, non-bloody vomiting attacks	MA	-	Laparotomy, anterior gastropexy
Bhesania, Natalie[39]	2 years	F	Persistent vomiting and abdominal pain that has been going on for 1 day	OA	Congenital posterior hiatal hernia	Hiatal hernia was repaired at laparotomy with thal fundoplication
El Azzouzi, Driss[40]	1 day	F	Excessive salivation, vomiting and failure to advance the nasogastric tube	OA	Hiatal defect wandering spleen	Laparotomy, hiatal defect repaired, thal fundoplication anterior gastropexy
Rai, Birendra[41]	8 months	F	Vomiting and irritability that have been going on for 7 days, and a slight cough with decreased oral intake in the last few days	OA	Paraesophageal hiatus hernia	Laparoscopic hiatal hernia repair
Shukla, Ram Mohan[42]	10 months	M	Acute intestinal obstruction, bilious vomiting and occasional hematemesis for the last two days. Difficulty inserting the Ryle's tube even with repeated attempts	OA	-	Total gastrectomy with closure of duodenal stump and esophago jejunostomy (Roux loop) (Figure 3) and jejunojejunostomy was done and diaphragmatic eventration repair
	6 months	F	Sudden abdominal distention, nonbilious vomiting, and restlessness for three days	MA	-	The necrotic stomach was excised, pyloromyotomy and oesophago-pylorostomy Plication of the diaphragm, jejunostomy
Hadjittofi, Christopher[43]	17 years	M	Acute severe epigastric pain which occurred a few minutes after meals	OA	Left-sided diaphragmatic hernia	Laparoscopic diaphragmatic hernia repair, anterior gastropexy

OA: Organoaxial, MA: Mesenteroaxial, GERD: Gastroesophageal reflux disease, GV: Gastric volvulus

REFERENCES

1. da Costa KM, Saxena AK. Management and outcomes of gastric volvulus in children: a systematic review. *World J Pediatr*. 2019;15(3): 226-234.
2. Takahashi T, Yamoto M, Nomura A, Ooyama K, Sekioka A, Yamada Y, et al. Single-incision laparoscopic gastropexy for mesentero-axial gastric volvulus. *Surgic Case Rep*. 2019;5(1):19.
3. Coe TM, Chang DC, Sicklick JK. Small bowel volvulus in the adult populace of the United States: results from a population-based study. *Am J Surg*. 2015;210(2):201-210.
4. Porcaro F, Mattioli G, Romano C. Pediatric gastric volvulus: diagnostic and clinical approach. *Case Rep Gastroenterol*. 2013;7(1):63-68.
5. Tillman BW, Merritt NH, Emmerton-Coughlin H, Mehrotra S, Zwiep T, Lim R. Acute gastric volvulus in a six-year-old: a case report and review of the literature. *J Emerg Med*. 2014;46(2):191-196.
6. Kadam R, Prasad V. Intrathoracic gastric volvulus presenting with GIT bleed. *J Neonat Surg*. 2017;6(2):40.
7. McCarthy LC, Raju V, Kandikattu BS, Mitchell CS. Infantile feeding difficulties: it is not always reflux. *Glob Pediatr Health*. 2014;1: 2333794X14553624.
8. Trecroci I, Morabito G, Romano C, Salamone I. Gastric volvulus in children-a diagnostic problem: two case reports. *J Med Case Rep*. 2016; 10(1):138.
9. Malhotra R, Daniel R, Besarovic S. A twist in the tale. *Case Rep*. 2013; 2013:bcr2012007905.
10. Patoulias D, Rafailidis V, Kalogirou M, Farmakis K, Rafailidis D, Patoulias I. Acute primary mesenteroaxial gastric volvulus in a 6 years old child; the contribution of ultrasonographic findings to the prompt diagnosis (a case report and review of the literature). *Folia Med Cracov*. 2017;57(3):47-55.
11. Zain M, Abada M, Abouheba M, Elrouby A, Ibrahim A. Acute intrathoracic gastric volvulus: a rare delayed presentation of congenital diaphragmatic hernia: a case report. *Int J Surg Case Rep*. 2020;70:123-125.

12. Bhambu SK, Awasthi PK, Mangal R, et al. Acute gastric volvulus with wandring spleen in a two-year-old child: a rare association. *Cureus*. 2023;15(5):e38386.

13. Yokoyama K, Yano T, Kumagai H, et al. Reduction of acute gastric volvulus in a 3-year-old using a balloon-attached endoscope combined with gel immersion endoscopy. *Clin J Gastroenterol*. 2022;15(1):95-100.

14. Yeh PJ, Lo WC, Chen JC. Gastric volvulus presented with an upside-down stomach. *Pediatr Neonatol*. 2022;63(4):422-423.

15. Haga M, Sano N, Kamiyama T, et al. Acute gastric volvulus successfully treated by endoscopic reduction in a 6-year-old girl and a review of the Japanese literature. *Pediatr Emerg Care*. 2019;35(11):e217-e219.

16. Pérez-Egido L, Parente A, Cerdá JA. Acute gastric volvulus and congenital diaphragmatic hernia, case report and review. *Afr J Paediatr Surg*. 2015;12(3):200-202.

17. Hara T, Iwama I, Hosokawa T, Nambu R. Successful endoscopic reduction of gastric volvulus in 2 children: acute and chronic cases. *J Pediatr Gastroenterol Nutr*. 2022;75(2):e30.

18. Shadrack M, Suleiman J, Msuya D, et al. Congenital diaphragmatic hernia with gastric volvulus and splenic herniation: an unusual delayed presentation in a six-month child. *East Afr Health Res J*. 2022;6(1):18.

19. Nalwalla Z, Dirkhipa TY, Jain R, Shah I, Bendre P. Retching without vomiting with acute abdominal distension: a clinical cue. *JPGN Rep*. 2023;4(4):e363.

20. Kumar S, Saxena R, Kumar R, Chauhan S, Diwakar K. Congenital diaphragmatic hernia with intra thoracic gastric volvulus: a rare, life-threatening combination. *Cureus*. 2023;15(4):e38354.

21. Oyachi N, Numano F, Fukatsu T, Nemoto A, Naito A. Volvulus of the stomach and wandering spleen after repair of congenital diaphragmatic hernia: unexpected manifestations in a neonate. *Surgic Case Rep*. 2022;8(1):178.

22. Miyano G, Murakami H, Nakamura H, Lane GJ, Yamataka A. Gastric volvulus associated with anomalous mediastinal origin of the diaphragm. *Pediatr Int: Offic J Japan Pediatr Soc*. 2022;64(1):e15097.

23. Kataria R, Sundaram J, Agarwal P, Lal T. Laparoscopic management of gastric volvulus, diaphragmatic eventration and wandering spleen in a child. *BMJ Case Reports CP*. 2021;14(6):e242441.

24. Cianci MC, Coletta R, Morabito A. Let's (not) twist again: laparoscopic-assisted percutaneous endoscopic gastrostomy in paediatric gastric volvulus. *Digest Dis Sci*. 2021;66(8):2533-2536.

25. Umeda S, Kimura K, Takama Y, Yamauchi K, Yonekura T. Laparoscopic retroperitoneal splenopexy for wandering spleen: a novel technique using a three-incision retroperitoneal pouch. *Asian J Endoscop Surg*. 2021;14(3):644-647.

26. Jones G, Adams L, Metz T, Akay B. Child with profound gastric distension. *Ann Emerg Med*. 2020;75(5):626.

27. Lee HS, Jung EJ, Park JS, Park T. Chronic gastric volvulus as a late complication of hepatectomy for hepatoblastoma in a child: a case report. *Pediatr Gastroenterol Hepatol Nutr*. 2019;22(6):608.

28. Tetsuhara K, Tsuji S, Tomonaga K. Paediatric abdominal compartment syndrome and shock associated with gastric volvulus improved rapidly by gastric suction in the emergency department. *BMJ Case Rep*. 2019;12(7):e229198.

29. Schneider J, Mays R. A 13-year-old with coexistence of gastric volvulus and leprosy: a case report of two rare entities. *Case Rep Infect Dis*. 2018;2018:6125215.

30. Qadri SK, Logarajah V, Nah SA, Jamuar SS. Feeding difficulty in an infant: an unusual cause. *BMJ Case Rep*. 2018;2018:bcr2018225289.

31. Serradilla J, Bueno A, De La Torre C, et al. Neonatal intrathoracic gastric volvulus in Marfan's syndrome. *Eur J Pediatr Surg Rep*. 2018;6(01):e48-e51.

32. Vaghela MM, Sinha AK, Kumar B, Kumar P. Chronic recurrent vomiting associated with primary gastric volvulus in infant: a case report and review of literature. *Afr J Paediatr Surg*. 2017;14(1):12-14.

33. Hasan MT, Rahman ST, Shihab HM, Mahmood HR, Chowdhury T, Sanju QA. A case report on gastric volvulus of a 17 years old boy from Bangladesh. *Int J Surg Case Rep*. 2017;40:32-35.

34. Cantone N, Gulia C, Miele V, Trinci M, Briganti V. Wandering spleen and organoaxial gastric volvulus after Morgagni hernia repair: a case report and review of the literature. *Case Rep Surg*. 2016;2016:6450765.

35. Takano Y, Horiike M, Tatsumi A, Sakamoto H, Fujino H, Sumimoto SI. A case of apparent life-threatening event: comorbid gastric volvulus associated gastroesophageal reflux disease and epilepsy in a 4-month-old boy. *Case Rep Pediatr*. 2016;2016:5717246.

36. Kumar K, Khanna V, Dhua AK, Bhatnagar V. Congenital diaphragmatic hernia with recurrent gastric volvulus and pulmonary sequestration: a "chance" combination. *J Indian Assoc Pediatr Surg*. 2016;21(1):38-40.

37. Farber BA, Lim IIP, Murphy JM, Price AP, Abramson SJ, La Quaglia MP. Gastric volvulus following left pneumonectomy in an adolescent patient. *J Pediatr Surg Case Rep*. 2015;3(10):447-450.

38. Espinola DC, Nankoe SR, Eslami PW. Acute gastric volvulus in a 16-year-old male adolescent: a case report. *Pediatr Emerg Care*. 2017;33(1):34-37.

39. Bhesania N, Anani A, Ochs H, Okwu V, Magnuson D, Kay M. Vomiting in a 2-year-old with a twist: undiagnosed gastric volvulus. *J Pediatr Gastroenterol Nutr*. 2017;64(4):e106.

40. El Azzouzi D. Primary intrathoracic gastric volvulus in the neonatal period: a differential diagnosis of esophageal atresia. *Pan Afr Med J*. 2014;17:261.

41. Rai B, Ahmed R, Amer N, Sharif F. Paraesophageal hiatus hernia in an 8-month-old infant with organoaxial volvulus of the stomach. *BMJ Case Rep*. 2014;2014:bcr2014204385.

42. Shukla RM, Mandal KC, Maitra S, et al. Gastric volvulus with partial and complete gastric necrosis. *J Indian Assoc Pediatr Surg*. 2014;19(1):49-51.

43. Hadjittofi C, Matter I, Eyal O, Slijper N. Laparoscopic repair of a late-presenting Bochdalek diaphragmatic hernia with acute gastric volvulus. *BMJ Case Rep*. 2013;2013:bcr2013008990.

44. Singleton AC. Chronic gastric volvulus. *Radiol*. 1940;34(1):53-61.